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DIVISION OF MYCOLOGY AND DISEASE SURVEY

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OBSERVATIONS ON COTTON DISEASES IN THE MISSISSIPPI DELTA

Paul R. Miller

In order to make a somewhat comprehensive survey of cotton diseases in the Mississippi Delta it was thought advisable to concentrate on a small area and then make limited observations in other sections to see if the chosen area was fairly representative of conditions in the Delta as a whole.

Washington County, where approximately 140,000 acres were grown this season, was selected for the intensive survey. Weather conditions here were characterized by excessive temperatures combined with a severe drought. The following was the weather record for Greenville, County seat of Washington County:

	Rainfall	Departure	Temperature departure
May	1.16 inches	+3.86 inches	+1.4° F.
June	1.40 inches	-1.91 inches	+2.5° F.
July	3.91 inches	+0.56 inches	+1.0° F.
August	0.23 inches	-3.74 inches	+3.7° F.

There were 19 days in August with a maximum temperature of over 100°. To summarize there was an accumulated shortage of 8.95 inches rainfall and an accumulated excess of 8.6° of temperature for the four months considered.

Rows from 75 fields comprising approximately 3,000 acres were selected at random and surveyed for diseases. Two hand registers were used concurrently in arriving at the percentage of diseased plants.

Wilt (Fusarium vasinfectum). The consensus of opinion of the growers, County agent and others interested in cotton in this region, was that wilt was unusually prevalent this year, but this opinion can not be verified since no comparable estimates were made in previous years. Moreover, field examinations showed that many plants which from roadside observations appeared to have wilt were in reality suffering from rust (malnutrition) or were wilting from insufficient moisture. Wilt was observed in 20 of the 75 fields examined, varying in amount from a trace to 75 percent. Where wilt was found on sandy soils in definitely outlined areas it was usually associated with root knot infection. Considering the fact that frequently actual

loss estimates have been made synonymous with the percentage of plants infected with wilt, it was surprising to find fields with a large percentage of the plants showing the usual wilt symptoms but apparently producing a normal yield. On the other hand the yield was considerably reduced on certain varieties showing the same wilt symptoms. Attempting to record the varietal reaction of the various cottons to wilt here this season by asking the grower the name of his variety and then making the observation proved futile due to the multiplicity of names applied to apparently the same variety. 1/

Wilt (Verticillium alboatrum). Of the 75 fields examined 8 were found to have Verticillium wilt varying in amount from a trace to 35 percent. It is possible that there was some Verticillium wilt recorded under the Fusarium wilt report above and vice versa, as it is not always possible to distinguish the two wilts by macroscopic observation. However, generally speaking, the Fusarium wilt was found on the lighter sandy type of soil whereas the Verticillium wilt occurred on the heavy, dark soil.

Bacterial blight (Bacterium malvacearum). Angular leaf spot and vein blight was generally found in all fields examined, but apparently owing to the dry, hot weather the damage was slight. Seven fields of rank cotton were observed to have about 20 percent of the bolls affected.

Anthracnose (Glomerella gossypii). Again the weather conditions probably held anthracnose to a minimum, as it was found only on a few bolls in 8 fields. This same statement probably applies to the other boll rots as they had not made their appearance to any extent, at the time this survey was terminated (September 10.)

Lightning injury. Thirteen areas were observed where apparently lightning had killed the plants. Three of these areas were in one 25-acre field.

"Rust" (Physiological). Although this trouble was observed to be more serious in the "hill" cotton grown on the lighter soils, it was frequently seen in the Delta, causing considerable loss. In addition fields were observed where there was about complete defoliation and premature death of plants by the middle of August. The plants, however, did not seem to be dwarfed, and upon further investigation it was learned that these soils were underlaid with quicksand and therefore the probable cause of this trouble was insufficient moisture. (Division of Mycology and Disease Survey. Chairman, Cotton Disease Survey Committee.)

1/ In preliminary use the cotton disease survey forms adopted by the Survey Committee were found to be unadapted for the large plantation type of cotton growing in this area.

WILL HEAT AND DRY WEATHER KILL VENTURIA INAEQUALIS?

H. W. Anderson

In view of the fact that the apple scab fungus is supposed to be a "cool, damp weather" fungus, I have been interested in seeing what would happen to the disease under extreme drought conditions. In 1934, one of the most severe droughts on record occurred in the western part of Illinois, where there is an extensive apple growing region. Temperatures of 100° to 112° were not uncommon during that summer. The 1935 season was favorable for scab, but in view of the extremely dry hot conditions of 1934, there was some question as to whether scab would come back in the western section of the State. It proved to be a very bad scab year in that section, although it was noticed that the heavy infections did not occur until fairly late in the spring. This was in part owing to the fact that the heavy rains did not occur in the spring of 1935 until May (May 1 is about full bloom date in this region). It is probable that the primary infections were very light, and that there was a gradual build-up to the point where general secondary infection occurred.

Again in 1936 the worst drought on record has occurred in this same region. Scab has been hard to locate this summer in most commercial orchards, but in a few where no spraying was done, on account of failure of fruit to set, some scab is evident. The question asked by the growers is, "Is this scab alive and what can be expected next year?" In order to answer this question, I brought in leaves from a station near Quincy, Illinois. These were collected during a heavy rain on September 2, which broke the long drought in that region. The evidence that the fungus was alive was: (1) the presence of normal conidia which germinated to the extent of about 1 percent, and (2) the development (after twenty-four hours in damp paper) of a zone of new hyphae about some of the old spots.

The weather records of this station show a remarkable situation so far as temperature and rainfall are concerned. On May 2, a heavy rain occurred (1.76 inches) and thereafter no rain of any consequence fell until September 2. The total rainfall after May 2 was: May .63 inches, June 1.46 inches, July .45 inches, and August .77 inches. (A rain on June 22 of .85 inches at Quincy was stated by the orchardist to have missed his orchard and his record states "light rain" for this date). The temperature records are also very interesting. In June there were seven days of temperatures of 100 or over with 105 as the maximum. In July there were 23 days of 100° or over with 114° as the maximum and with 15 consecutive days of 100 or above and a mean maximum of 101.5 for the entire month. In August there were 18 days of 100 or over with 108 as the maximum. These eighteen days were consecutive, except for the second day of the series, when the maximum was 97.

It does not seem possible, therefore, that high temperatures or lack of moisture during the summer months can eradicate scab from any region where it can become established in the spring.

It is interesting to note that scab is developing this fall on the undersides of the leaves in those orchards which were not sprayed or where the sprays were applied at the wrong time, while in properly sprayed orchards, no scab can be found, even though spraying was discontinued shortly after petal fall. (Illinois State College of Agriculture and Agricultural Experiment Station.)

FURTHER OBSERVATIONS ON SILVER LEAF OF FRUIT TREES IN NEW YORK

E. M. Hildebrand

During the summer of 1936 an outbreak of silver leaf appeared on Baldwin apple trees in the Cornell University orchard at Ithaca. These trees were severely injured by the extremely low temperatures of the winter of 1933-34, and none have recovered fully. A considerable amount of pruning was done in 1934 after the status of the injury was known. From the dead stubs of some of these pruning wounds the perfect stage of the silver-leaf fungus, Stereum purpureum, was collected and identified in 1935. Symptoms of silver leaf first appeared in 1936 about July 1. In one row of twelve trees, for example, six had one or more branches affected. In all cases the infected branches were associated with pruning wounds that had failed to callus over owing to winter injury. By the last week of July one branch was dead. Most of the others, aside from the silvered and frazzled leaves, were still alive late in September. In the only case thus far examined a fungus characterized by a white mycelium with clamp connections was readily isolated from the undiscolored wood in close proximity to the unhealed pruning wound. It appears to be Stereum purpureum although its exact identity has not yet been determined. A variety of fungi were obtained from the discolored winter-injured tissue none of which have been identified.

In this connection it might be worth mentioning that when isolations were attempted from winter-injured trees at various distances from pruning wounds late in 1934 a variety of fungi were obtained from different locations in the wood, some as far removed as five or six feet from an open court or wound.

The status of the silver leaf outbreak last year on Montmorency cherry in Western New York (Plant Dis. Reptr. 19(14):236. 1935) was reexamined in 1936. The percentage of trees showing symptoms was 4 in contrast to 15 for 1935. Doubtful cases are not included. While it was

not permissible to attempt isolations from the main framework of these trees all isolation trials from the woody tissues of silvered branches have been negative for Stereum purpureum. The remarkable recovery of these trees in one season supports the idea that exposure may have played a more important role than the fungus in the cause of the trouble.

Occasional trees affected with silver leaf have been noted from other fruit sections of New York this year but as usual no case has been of any consequence economically. (New York Agricultural Experiment Station.)

BOXWOOD DISEASES IN VIRGINIA

J. G. Harrar and S. A. Wingard

Boxwood troubles have been under investigation for some time and recently a survey of the State was made for the purpose of determining, in so far as possible, the major causes of boxwood damage. Both the tree and dwarf forms of Buxus (forms of B. sempervirens) are common in Virginia and both have suffered extensively during the past several years. Mycological investigations have shown that Macrophoma and Volutella are the two fungi most commonly encountered on Buxus in Virginia. Nectria canker is not found commonly although it has been collected several times. Verticillium, Phoma, Rhizoctonia, Fusarium, and Phomopsis have all been isolated from diseased specimens.

It has thus far been impossible to infect healthy Buxus plants with either Macrophoma candollei or Volutella buxi. Repeated inoculations into both healthy and weakened plants have failed to produce infection. However, dead or dying leaves are quickly attacked by both of these fungi. This is easily demonstrated in a moist chamber containing leaves of the host plant. At present, it appears that these fungi are saprophytes or at best very weak parasites and do not attack healthy plants readily. Serial sections and isolations from the tips of diseased twigs down to healthy wood have failed to show the presence of either of these fungi in the stem tissues at any appreciable distance below the leaves.

Nectria rousselliana apparently is able to kill twigs and branches of Buxus by girdling the twig or branch. However, the fungus has not been found commonly and efforts to transmit the parasite have been only partially successful. It has been suggested that the presence of Volutella on the twigs indicates a Nectria infection below, but this is definitely not the case in many instances. It is thought that Nectria is a slowly acting weak parasite which is not readily transmitted to healthy plants.

A common symptom of diseased boxwood plants is a dead or dying twig on which darkened or water soaked spots are observed. When the outer bark is cut away, the cortical layers and cambium are found to be blackened and killed. Microscopic examination reveals that the cells are dead and are filled with a mucilaginous substance. This condition is frequently

localized and does not extend to any distance above or below the necrotic region. Obviously the twig dies as soon as it is completely girdled, but if it is cut back below the girdled area a new shoot may arise which is apparently healthy. This condition has been known for some time, but has been more prevalent during the past few years. It is commonly known as "blue rot". Isolations from branches with blue rot have almost invariably resulted in pure cultures of species of Verticillium. From cultural characteristics, it is apparent that several strains have been obtained. Other fungi have been isolated but Verticillium has been found to predominate. However, efforts to cause infection with the several strains of Verticillia isolated have been largely unsuccessful. Only one plant in twenty-five has died to date. Further experiments are in progress.

Insect pests have been very common of recent years and are apparently on the increase. It has been suggested that they are directly related to the increased incidence of boxwood blights of recent years, but such a supposition has not been demonstrated to be factual.

From the observations and experiments of the past few years, as well as from a survey of recent literature, a number of ideas have been obtained as to the nature of boxwood troubles in Virginia. The major conclusion which has been reached is that the boxwoods are normally rather hardy plants with few fungous parasites. However, it seems rather evident that these plants can readily be predisposed to the attack of various fungous parasites. Winter injury, wind injury, mechanical injury (wounds), insect attack, drouth, lack of food, etc., all appear to be predisposing factors. In support of this theory is the fact that it is virtually impossible to infect Buxus sp. with any of the common fungi appearing on diseased plants. In addition, it has been found by actual observation that boxwood plantings that are watered periodically, fertilized early in the spring with manure, commercial fertilizers, tankage, bone meal, cotton seed meal, etc., and protected from sun and winter injury, are free from diseases, also that apparently dying plants have been restored to their normal vigor by careful feeding and protection from pests and mechanical injury. (Virginia Agricultural and Mechanical College and Agricultural Experiment Station.)

CERCOSPORA LEAF SPOT OF CALENDULA IN VIRGINIA

J. G. Harrar

A leaf spot of Calendula spp., first noted in 1933, has been found in increasing quantities since that time. Apparently there has been no published study of the disease although a Cercospora leaf spot of calendula has been reported on four occasions. An examination of diseased material and a study of the causal fungus resulted in its identification as Cercospora calendulae Sacc.

On the host plant typical Cercospora lesions appear first on the leaves. These may frequently coalesce and enlarge to form a necrotic area. Eventually many leaves are killed and the whole plant may be blighted. The parasite spreads rapidly and once established usually affects the whole planting. Diseased plants frequently are unable to set seed. Seedlings are apparently not affected as only plants of from four to six weeks of age have been observed to be attacked.

The conidiospores of the fungus are largely air-borne and most summer infection occurs in this manner. It is probable that the parasite overwinters in the soil and in diseased plant parts. Soil-borne infection has been demonstrated. There is some evidence that insects assist in the mechanical dissemination of the conidiospores. Seed transmission does not normally occur.

Tests with seventeen varieties of Calendula officinalis showed no indication of varietal resistance. Although some varieties seem slightly more tolerant than others, no significant evidence of varietal resistance was obtained. The plants reacted definitely to predisposing factors by showing a marked increase in susceptibility when injured in one of several ways.

Control of Cercospora calendulae is readily obtained by the use of Bordeaux mixture, lime sulfur, copper oxide, or sulfur dust. (Virginia Agricultural and Mechanical College.)

POWDERY MILDEWS COLLECTED IN VIRGINIA

J. G. Harrar

As might be expected, the past two years have been extremely conducive to the appearance of powdery mildews on numerous plants. During the past two summers the following forms have been collected from various parts of the State:

Erysiphe cichoracearum DC. on Cucumis sativus, Helianthus annuus, Phlox spp., Plantago spp., Rudbeckia laciniata, Solidago spp., Verbesina alternifolia, and Zinnia elegans.

Erysiphe graminis DC. on Hordeum vulgare, Secale cerale, and Triticum aestivum.

Erysiphe polygoni DC. on Azalea spp., Clematis sp., Dahlia spp., Delphinium spp., Lathyrus odoratus, Phaseolus spp., Pisum sativum, Primula spp., and Trifolium pratense.

Microsphaera alni (Wallr.) Wint. on Lonicera spp., Quercus albus, and Syringa vulgaris.

Microsphaera alni vaccinii (Schw.) Salm. on Catalpa sp.

Podosphaera oxyacanthae (Fr.) deBy. on Prunus sp.

Sphaerotheca humuli (DC.) Burr. on Fragaria sp. and Rosa spp.

Uncinula circinata Cke. & Pk. on Acer dasycarpum and A. rubrum.

Uncinula necator (Schw.) Burr. on Ampelopsis spp. and Vitis sp. (Virginia Agricultural and Mechanical College.)

TREATMENT OF IMPORTED NARCISSUS BULBS

A mimeographed circular (B. E. P. Q.--412. Sept. 16, 1936) issued by the Bureau of Entomology and Plant Quarantine announces that after December 15, 1936, unlimited entry of foreign narcissus bulbs will be permitted, but in order to prevent the distribution within the United States of foreign bulbs infested with the bulb eelworm, Anguillulina dipsaci, plant quarantine inspectors will require all imported narcissus bulbs to be given the latest approved treatment as a condition of entry. This treatment is described as follows:

Those in interest are informed that the plant quarantine inspector will construe the term "latest approved treatment" to consist of soaking the bulbs in water at a temperature of 70 to 80° F., preferably 75°, for a period of two hours after which the bulbs are to be held in hot water until all the bulbs have reached a temperature of 110 to 111° F., throughout. The bulbs are then to be held in hot water at a temperature of not less than 110° F., for a period of four hours. As a precautionary measure to check the subsequent dissemination of diseases such as basal rot, a pint of formalin may be added for each 35 gallons of water, but the addition of the disinfectant is optional with the importer.

NOTES ON THE CONDITION OF ZOSTERA MARINA IN BUTTERMILK BAY, MASSACHUSETTS

Neil E. Stevens

Plant diseases almost invariably attract most attention during periods of great or increasing severity. Records, even of their rate of decline, are in most cases woefully incomplete.

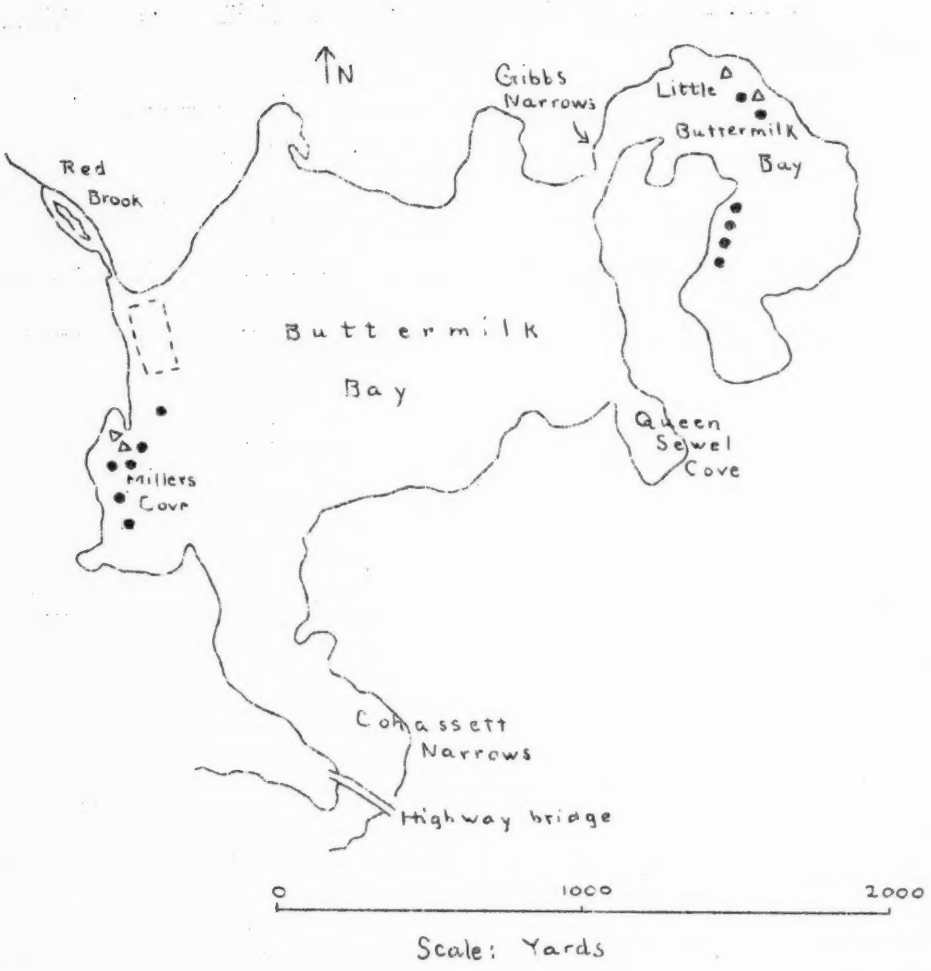

Figure 48. Chart of upper Buzzards Bay, Massachusetts. Eel grass (Zostera marina) found in September 1936 at points indicated. See text for explanation.

In the case of the wasting disease of eel grass the usual practice may, of necessity, be reversed. The destruction of the greater portion of the stands of this native plant throughout its range, on both sides of the Atlantic, was so sudden that little opportunity was given for observation or experiment. If, on the other hand, it is now on the increase, as a number of observers believe, it should be possible

to record the rate of its spread and perhaps study the conditions which have accompanied its return.

My own contribution to this fascinating problem will probably be confined to recording, from time to time, the status of Zostera marina in upper Buzzards Bay (Buttermilk Bay), a region in which it was notably abundant for many years, and was almost completely destroyed between September, 1931, and September, 1932.

The warmer months of two growing seasons have passed since my last opportunity to make a survey of this region. At that time, early July, 1935 (P.D.R. 19:232-233), the only eel grass that was found consisted of a few patches near the mouth of Red Brook, the only considerable stream of fresh water entering the bay. These were carefully observed and measured during several low tides in early September, 1936. There are now four, two on each side of the little channel formed by Red Brook. The sizes of these patches on September 12, 1936, beginning with the one farthest up the channel, were 3 yards by 3 yards, 3 by 5 yards, 10 by 8 yards, and 2 by 6 yards. Eel grass is present in an area of which these larger growths form the northwest corner extending east about 60 yards and south about 120 yards. The eel grass decreases in abundance and in the size of the individual clumps more or less regularly from this northwest corner outward in both directions over approximately the area enclosed in the broken line in the chart (Fig. 48). In addition to this area, eel grass is now present in Millers Cove, two patches at least a yard across at the places marked, ▲, and a number of smaller ones at approximately the places indicated by dots.

In 1935 no eel grass was found in Little Buttermilk Bay, although it is known to have been very abundant there prior to 1932. This year, however, two patches about a yard across were found near the north shore, one east and one west of the only boat landing in Little Buttermilk Bay, at the places marked by ▲, and a number of smaller ones at approximately the points indicated by dots. These may readily be located by any interested investigator by following a line between the above mentioned landing and the top of the railway bridge across Cape Cod Canal, which is readily visible from the water at this point.

The condition of the eel grass was studied at a number of places. Roots, rhizomes, and leaves all appear to be in a vigorous and healthy condition. Ruppia maritima has increased decidedly in amount in both Little Buttermilk Bay and Millers Cove. This, however, appears to be much less effective than Zostera marina, according to local observers, in furnishing protection to scallops, in which the Bay formerly abounded. (University of Illinois.)

SHORT NOTES ON PLANT DISEASES

BEAN RUST IN MASSACHUSETTS: Bean rust, Uromyces phaseoli typica, is general in Plymouth and Bristol Counties. Infection ranges from a trace to severe on green snap beans. It is most pronounced on the Bountiful variety, and is mostly light on French Horticultural shell beans. I have never before seen it so abundant on bush beans as it is at present. (O. C. Boyd, September 18.)

BACTERIAL WILT OF CORN IN PENNSYLVANIA: There is very little bacterial wilt (Aplanobacter stewarti) in Pennsylvania this year. In one or two of our variety demonstrations we have found as much as 1 percent wilt on susceptible varieties. Our average will be about 0.1 percent for the State. (R. S. Kirby.)